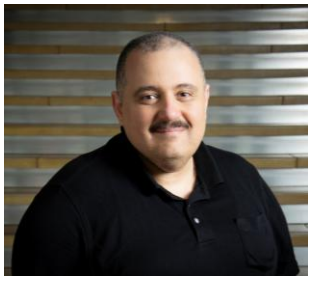
MARQUETTE UNIVERSITY

Departmental Colloquium
Electrical and Computer Engineering

Advanced Electrical Drivetrains for Propulsion and Traction Applications

Tuesday, January 20, 2026
2:00 pm – 3:00 pm
E-Hall 236

Reception to follow
3:00 pm – 3:30 pm
E-Hall 136



Dr. Ayman EL-Refaie
Werner Endowed Chair Professor of Electrical and Computer Engineering, Marquette University

ABSTRACT: The presentation will cover the following 2 topics:
1. Very high specific power electric drivetrain for aerospace including the motor, modular integrated drive and thermal management system: This part of the presentation will provide an overview of an ARPA-E project led by Marquette University as a part of the ASCEND program to develop very high specific power electric drivetrains for hybrid and electric propulsion for aerospace applications. The target is system specific power of 12 kW/kg. The project introduces novelties in the electric motor, electric drive and thermal management system. These include additively-manufactured coils integrated with heat pipes, modular power electronics tightly integrated with the motor and integrated thermal management system.
2. Low-cost rare-earth free electric drivetrain for EVs/HEVs including the motor, low-cost inverter and thermal management system: This part of the presentation will provide an overview of a DOE project led by Marquette University to develop low-cost rare-earth free electric drivetrains for hybrid and electric traction applications. The target is system cost < $7/kW, system power density > 12 kW/liter and DC bus voltage > 700V. The project introduces novelties in the electric motor, electric drive and thermal management system. The focus of the presentation will be on the motor side where novel design combining different types of magnets have been developed and evaluated.

BIOGRAPHY: Ayman M. El-Refaie (Fellow IEEE) received the M.S. and Ph.D. degrees in electrical engineering from the University of Wisconsin Madison in 2002, and 2005, respectively. Between 2005 and 2016 he has been a principal engineer and a project leader at the Electrical Machines and Drives Lab at General Electric Global Research Center. His interests include electrical machines and drives. Since January 2017 he joined Marquette University as the Werner Endowed Chair for Energy Sustainability. He has over 250 journal and conference publications. He has 50 issued US patents. He was a technical program chair for the IEEE 2011 Energy Conversion Conference and Exposition (ECCE). He was the general chair for ECCE 2014 and 2015 ECCE steering committee chair. He was the general chair of IEMDC 2019. He was the IEEE IAS Industrial Power Conversion Systems Department Chair. He was the IAS Publications Department Chair. He is currently serving as IAS president . He is a fellow of the IEEE, IET, NAI and a member of Sigma Xi. He received several prestigious awards. He is the recipient of six paper awards.